§7. Calculation of Radiation Field in the Site on LHD DD Operation.

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There is a plan that D-D reaction experiments are done for the next phase of LHD experiment. While the experiment, 2.45 MeV neutrons due to D-D reaction and gamma rays are generated. On the point of safety, radiation dose due to these radiation in working area or site boundary should be evaluated as accurate and precise as possible.

In this study, the fluence data of neutron and gamma ray at the point of outdoor monitoring stations were calculated with two dimensional radiation transportation code DOT 3.5 by using the FUSION-40 nuclear data set. Though the plasma, the helical coil and vacume vessele of LHD has helical shape, it is difficult to model it on two dimensional design. Then we made a horizontal port model and a vertical port model, the radiation field of each model was calculated respectively. The composed radiation field of two models is adopted. The number of generated neutrons from standard one experiment shot is assumed 2.4×10^{17} for 2.45 MeV with DD reaction, 2.4×10^{15} for 14 MeV with DT reaction.

The radiation fluence data at monitoring points were calculated about the direct component and skyshine. For calculation of the radiation transport outside the building, the ground soil which has a thickness of 1 m was assumed. The radiation source of direct component was set on the outside surface of the shielding wall in the height of equatorial plane of LHD. The information of the source those were intensity, direction and energy distribution was conserved to the calculation result for inside of the shielding wall. The source of skyshine component was set on the roof at the right above the center of LHD.

The gamma ray and neutron energy spectrum at several monitoring points in the site is shown in Fig.1 and Fig. 2. This express the composed value of direct component and skyshine. The shape of spectrum differs among points, which is caused by the distance from LHD or the height from ground level.

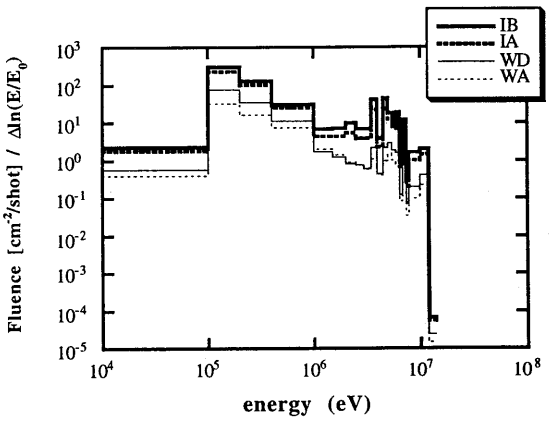

Fig. 1. Gamma ray fluence at monitoring points.

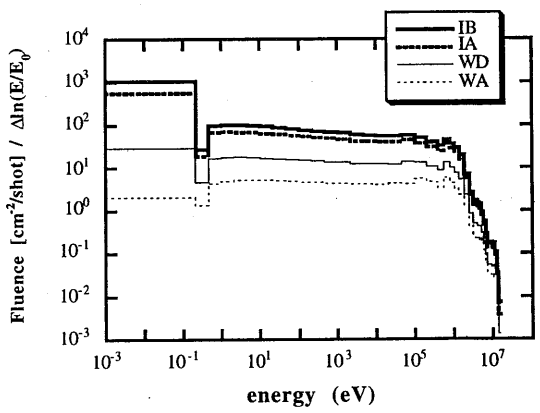

Fig. 2. Neutron fluence at monitoring points.